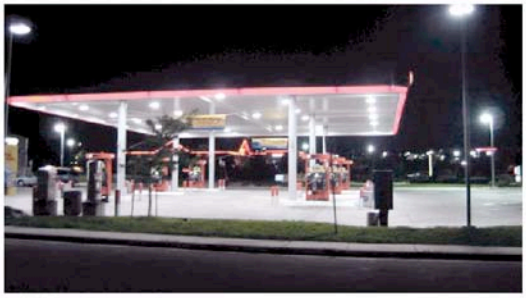
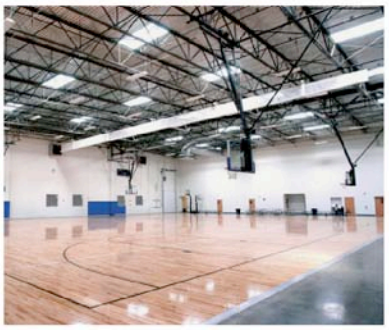
2005 BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION






NONRESIDENTIAL COMPLIANCE MANUAL

COMMISSION CERTIFIED MANUAL

CEC-400-2005-006-CMF
Revision 3

Arnold Schwarzenegger
Governor

4Q-05

Certificate of Occupancy

Building departments shall not release a final Certificate of Occupancy until a Certificate of Acceptance is submitted that demonstrates that the specified systems and equipment have been shown to be performing in accordance with the Standards. The installing contractor, engineer of record or owner's agent upon completion of undertaking all required acceptance requirement procedures shall record their State of California Contractor's License number or their State of California Professional Registration License Number on each Certificate of Acceptance that they issue.

Forms

Acceptance tests are documented using a series of forms. Table 2-2 lists Lighting and Mechanical Forms and references Standards and ACM Manual Appendix sections.

Table 2-2 – Acceptance Forms

Section	Form Name	Standards Reference	ACM Manual Appendix Reference
Lighting	LTG-1-A Certificate of Acceptance	§10-103	N/A
	LTG-2-A Lighting Controls	§119(d) and §131(d)	NJ 6.2, 6.3 and 6.4
	LTG-3-A Automatic Daylighting	§119(e)	NJ 6.1
Mechanical	MECH-1-A Certificate of Acceptance	§10-103	N/A
	MECH-2-A Ventilation Systems – Variable and Constant Volume	§121(b)2	NJ 3.1 and 3.2
	MECH-3-A Packaged HVAC Systems	§121(b)2	NJ 4.1
	MECH-4-A Economizer	§144(e)	NJ 7.1
	MECH-5-A Air Distribution Systems	§144(k)	NJ 5.1
	MECH-6-A Demand Control Ventilation	§121(c)4.E.	NJ 8.1
	MECH-7-A Supply Fan VFD	§144(c)	NJ 9.1
	MECH-8-A Hydronic Systems Control	§144(j)6	NJ 10.1 – 10.5

2.2.8 Field Verification and/or Diagnostic Testing

When single-zone, constant volume systems serving less than 5,000 ft^2 of floor area have more than 25% of their duct area running through unconditioned spaces, the duct sealing is prescriptively required [§144(k)]. A third-party inspection of the site and verification that the air distribution ducts are tested and have been properly sealed is required. The Energy Commission has a process for certifying Home Energy Rating System (HERS) raters who perform third-party inspections. A certified third-party HERS rating is required when verification of duct sealing is necessary.

2.2.9 Occupancy Permit

The final step in the compliance and enforcement process is when Occupancy Permit is issued by the building department. This is the green light for the building to be occupied. While a developer might actually lease space before the occupancy permit is issued, the tenant can't actually move in until the building

Table 3-11 – Wall Requirements

Summary from Standards Tables 143-A and 143-B

Wall Requirements		Climate Zones				
Space Type	**Criterion**	1,16	3-5	6-9	2,10-13	14, 15
Nonresidential	R-value or	13	11	11	13	13
	U-factor					
	Wood frame	0.102	0.110	0.110	0.102	0.102
	Metal frame	0.217	0.224	0.224	0.217	0.217
	Metal building	0.113	0.123	0.123	0.113	0.113
	Mass/7.0≤ HC<15.0	0.330	0.430	0.430	0.430	0.430
	Mass/15.0≤HC	0.360	0.650	0.690	0.650	0.410
	Other	0.102	0.110	0.110	0.102	0.102
Residential High-rise	R-value	19	11	11	13	13
	U-factor					
	Wood frame	0.074	0.110	0.110	0.102	0.102
	Metal frame	0.183	0.224	0.224	0.217	0.217
	Metal building	0.061	0.123	0.123	0.113	0.113
	Mass/7.0≤ HC<15.0	0.330	0.430	0.430	0.430	0.430
	Mass/15.0≤HC	0.360	0.650	0.690	0.650	0.410
	Other	0.074	0.110	0.110	0.102	0.102
Public School Buildings	R-value	13	13	13	13	13
	U-factor					
	Wood frame	0.102	0.102	0.102	0.102	0.102
	Metal frame	0.261	0.261	0.261	0.261	0.261
	Metal building	0.061	0.061	0.061	0.061	0.061
	Mass/7.0≤ HC<15.0	0.330	0.330	0.330	0.330	0.330
	Other	0.102	0.102	0.102	0.102	0.102

The U-factor criteria for walls depend on the class of construction. U-factors used for compliance must be selected from Joint Appendix IV. There are six classes of wall constructions: wood frame, metal frame, metal building walls, medium mass, high mass, and other (Figure 3-13). The "other" category is used for any wall type that does not fit into one of the other five wall classes. The following bullets give more information.

- **Wood-framed walls.** As defined by the International Building Code, Type IV buildings typically have wood-framed walls. Framing members typically consist of 2x4 or 2x6 framing members spaced at 24 in. or 16 in. OC. Composite framing members and engineered wood products also qualify as wood-framed walls if the framing members are non-metallic. Structurally insulated panels (SIPS) are another construction type that qualifies as wood framed. SIPS panels typically consist of rigid foam insulation sandwiched between two layers of oriented strand board (OSB). Joint Appendix IV, Table IV.9 has data for conventional wood-framed walls and Table IV.10 has data for SIPS panels.

and shall comply in each case. Approved compliance programs shall automate the rotation of the building and reporting of the compliance results to insure it is done correctly and uniformly and to avoid unnecessary documentation.

3.7 Overall Envelope Approach

§143(b)

The overall envelope approach offers greater design flexibility. It allows the designer to make trade-offs between many of the building envelope components. For example, if a designer finds it difficult to insulate the walls to a level adequate for meeting the wall component U-factor requirement, then the insulation level in a roof or floor or the performance of a window component could be increased to offset the under-insulated wall. The same holds true for glazing. If a designer wants to put clear, west-facing glass to enhance the display of merchandise in a show window, it would be possible to use lower SHGC glazing on the other orientations to make up for the increased SHGC on the west.

The overall envelope approach has two parts, and both parts must be met: overall heat loss and overall heat gain. The overall heat loss accounts for the insulating qualities of the building and sets a maximum rate of conductive heat transfer through the building envelope. The requirements are more stringent in more extreme climate zones than in mild climate zones. The overall heat gain accounts for the area of windows and skylights and their ability to block solar heat gains, thereby reducing cooling loads on the building. Cool roofs are also accounted for in the overall heat gain calculations. The heat gain requirements are more stringent in warmer climate zones.

A standard design value and a proposed design value are calculated for both the overall heat loss and the overall heat gain. The standard design building complies with the exact requirements of the prescriptive approach. The standard values are compared to the proposed values calculated from the actual envelope design. If the proposed values do not exceed the standard values, then the overall building envelope requirements are met.

While the overall envelope approach increases design flexibility, this comes at the expense of the complexity of the calculations.

3.7.1 Overall Heat Loss

There are two parts to the overall heat loss calculation. The first is to calculate the standard building heat loss; this becomes the standard that must be met. The second is to calculate the proposed building heat loss, which is compared to the standard to show that it does not exceed the standard building heat loss.

There are five steps to calculating the standard building heat loss:

Step 1 - Calculate areas of each type of envelope assembly (walls, windows, roofs, etc.). If glazing exceeds the maximum allowed area, calculate window adjustment factors as directed on part 1 of form ENV-3-C.

Occupancy / Use	UBC Table No. 10-A		Choose Largest		
	ft²/Occupant	Number of People per 1000 ft²	Ventilation CEC STD Table 121-A cfm/ft²	UBC Based Ventilation cfm/ft²	Req. Ven (Choose largest) cfm/ft²
Hotel Function Area (3)	15.0	67	0.15	0.50	0.50
Hotel Lobby	100.0	10	0.15	0.08	0.15
Hotel Guest Rooms (<500 ft²)	200.0	5	Footnote 4	Footnote 4	Footnote 4
Hotel Guest rooms (>=500 ft²)	200.0	5	0.15	0.04	0.15
Highrise Residential	200.0	5	Footnote 5	Footnote 5	Footnote 5
16) Kitchen(s)	200.0	5	0.15	0.04	0.15
17) Library: Reading Rooms	50.0	20	0.15	0.15	0.15
Stack Areas	100.0	10	0.15	0.08	0.15
18) Locker Rooms	50.0	20	0.15	0.15	0.15
19) Manufacturing	200.0	5	0.15	0.04	0.15
20) Mechanical Equipment Room	300.0	3	0.15	0.03	0.15
21) Nurseries for Children - Day Care	50.0	20	0.15	0.15	0.15
22) Offices: Office	100.0	10	0.15	0.08	0.15
Bank/Financial Institution	100.0	10	0.15	0.08	0.15
Medical & Clinical Care	100.0	10	0.15	0.08	0.15
23) Retail Stores (See Stores)					
24) School Shops & Vocational Rooms	50.0	20	0.15	0.15	0.15
25) Skating Rinks: Skate Area	50.0	20	0.15	0.15	0.15
On Deck	15.0	67	0.15	0.50	0.50
26) Stores: Retail Sales, Wholesale Showrooms	30.0	33	0.20	0.25	0.25
Basement and Ground Floor	30.0	33	0.20	0.25	0.25
Upper Floors	60.0	17	0.20	0.13	0.20
Grocery	30.0	33	0.20	0.25	0.25
Malls, Arcades, & Atria	30.0	33	0.20	0.25	0.25
27) Swimming Pools: Pool Area	50.0	20	0.15	0.15	0.15
On Deck	15.0	67	0.15	0.50	0.50
28) Warehouses, Industrial & Commercial Storage/Stockrooms	500.0	2	0.15	0.02	0.15
29) All Others -- Including Unknown	100.0	10	0.15	0.08	0.15
Corridors, Restrooms, & Support Areas	100.0	10	0.15	0.08	0.15

criteria previously described it must meet or exceed the leakage rate of < 6% of fan flow.

If the new ducts are an extension of an existing duct system the combined system (new and existing ducts) must meet:

- A leakage rate of < 15% of fan flow, or
- A reduction in leakage rate of > 60% (as compared to the existing ductwork) with all "accessible" leaks demonstrated through visual inspection to have been sealed, or
- All accessible leaks shall be sealed and verified through a visual inspection by a certified HERS rater.

There is an exception for ducts that are connected to existing ducts with asbestos insulation or sealant.

These requirements also apply to cases where existing HVAC equipment is either repaired or replaced. With exceptions for ducts that are insulated or sealed with asbestos and an existing duct system that has previously been leakage tested by a certified California HERS rater (see http://www.energy.ca.gov/HERS/).

One can avoid sealing the ducts by insulating the roof and sealing the attic vents as part of a larger remodel, thereby creating a conditioned space within which the ducts are located, and no longer meets the criteria of §144 k.

Another alternative to duct sealing is to install a high efficiency air conditioner that will save as much energy as the duct system is losing through leaks. This trade-off can be calculated using the performance software or by using pre-calculated equipment efficiencies deemed comparable to duct sealing. In climate zones 1-15, systems with air conditioner efficiencies at least as high as those in Table 4-5 are deemed equivalent to duct sealing.

Section 4.4.3 describes mandated acceptance test requirements for ductwork.

- COLUMN M – DESIGN MINIMUM SETPOINT. This design setpoint must be less than or equal to COLUMN L and greater than or equal to COLUMN H.
- COLUMN N - TRANSFER AIR is the amount of air that must be directly transferred from another space so that the space supply is always no less than REQ'D V.A

On a multiple zone system it is required if the value in COLUMN M is less than the value in COLUMN H. If required, it must be larger than

- TRANSFER AIR (COLUMN N) ≥ COLUMN H - COLUMN M

On a single zone system it is required if the value in COLUMN H is less than the OSA schedule for the unit. If required, it must be larger than

- TRANSFER AIR (COLUMN N) ≥ COLUMN H – Schedule OSA

TOTALS are summed for

- NUMBER OF PEOPLE – This should be consistent with the values used for the load calculations
- REQ'D V.A - The values listed on the plans as identified on MECH-2-C, Part 1 of 3 for Minimum Ventilation must be at least this amount. The designer may elect to use a greater amount of outdoor air judged necessary to ensure indoor air quality.
- DESIGN Ventilation AIR – This should be consistent with the values used for the load calculations

4.11.7 MECH-4-C: HVAC Misc. Prescriptive Requirements:

Fan Power Consumption

This form is used to list fan power consumption limits, electric resistance heating system capacity, and centrifugal fan cooling tower limits (heat rejection), and air-cooled chiller limits requirements.

The PROJECT NAME and DATE, should be entered at the top of the form. See §144(c).

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Volume Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach.

Fan Power Consumption

This section is used to show how the fans associated with the space-conditioning system comply with the maximum fan power requirements. All supply, return, exhaust fans, and space exhaust fans – such as toilet exhausts – in the space-conditioning system that operate during the peak design period must be listed. Included are supply/return/exhaust fans in packaged equipment. Economizer relief fans that do not operate at peak are excluded. Also excluded are all fans that are manually switched and all fans that are not directly associated with moving conditioned air to/from the space-conditioning system, such as condenser fans and cooling tower fans.

If the total horsepower of all fans in the system is less than 25 HP, then this should be noted in the FAN DESCRIPTION column and the rest of this section left blank. If the total system horsepower is not obvious, such as when a VAV system has many fan-powered boxes, then this section must be completed.

VAV fans and constant volume fans should be summarized on separate forms.

- COLUMN A - FAN DESCRIPTION lists the equipment tag or other name associated with each fan.
- COLUMN B - DESIGN BRAKE HORSEPOWER lists the brake horsepower, excluding drive losses, as determined from manufacturer's data.

For dual-fan, dual-duct systems, the heating fan horsepower may be the (reduced) horsepower at the time of the cooling peak. If unknown, it may be assumed to be 35% of design. If this fan will be shut down during the cooling peak, enter 0 in
COLUMN B.

If the system has fan-powered VAV boxes, the VAV box power must be included if these fans run during the cooling peak (i.e. series style boxes). The power of all boxes may be summed and listed on a single line. If the manufacturer lists power consumption in watts, then the wattage sum may be entered directly in COLUMN F. Horsepower must still be entered in COLUMN B if the designer intends to show that total system has less than 25 HP.

- COLUMNS C & D - EFFICIENCY lists the efficiency of the MOTOR and DRIVE. The default for a direct drive is 1.0; belt drive is 0.97. If a variable-speed or variable-frequency drive is used, the drive efficiency should be multiplied by that device's efficiency.
- COLUMN E - NUMBER OF FANS lists the number of identical fans included in this line.
- COLUMN F - PEAK WATTS is calculated as:

((BHP x Number of Fans x 746W/HP) / (Motor Efficiency, E_m x Drive Efficiency, E_d) where *BHP* (COLUMN B) is the design brake horsepower as described above, E_m (COLUMN C) and E_d (COLUMN D) are the efficiency of the motor and the drive, respectively.

Totals and Adjustments

- TOTALS FANS SYSTEMS POWER is the sum of all PEAK WATTS from (COLUMN F). Enter sum in provided box at the right.
- SUPPLY DESIGN AIRFLOW (CFM) Enter sum in provided box at the right (under COLUMN F) to identify the design airflow of the system.
- TOTAL FAN SYSTEM POWER INDEX, W/cfm is calculated by dividing the total PEAK WATTS (COLUMN F) by the total cfm. To

the details of the requirements. The following discussion is addressed to the designer preparing construction and compliance documents, and to the building department plan checkers who are examining those documents for compliance with the Standards.

The use of each form is briefly described below, and complete instructions for each form are presented in the following subsections. These forms may be included in the lighting equipment schedules on the plans, provided the information is in a similar format as the suggested form.

- *LTG-1-C: Certificate of Compliance*:
  This form is required for every job, and it is required to appear on the plans.
- *LTG-2-C: Interior Lighting Schedule:*
  This form is required for all submittals.
- *LTG-3-C: Portable Lighting Worksheet:*
  This form is required for all submittals.
- *LTG-4-C: Lighting Controls Credit Worksheet:*
  This form should only be required when calculating control credit watts. See Standards Table 146-A for lighting control credits.
- *LTG-5-C: Interior Lighting Power Allowance Worksheet:*
  This form is required when calculating the Lighting Power Allowance using the Complete Building, Area Category, or Tailored Method for compliance.
- *LTG-6-C: Tailored Method Worksheet:*
  This form should only be required when calculating the Lighting Power Allowance using the Tailored Method.
- *LTG-7-C: Room Cavity Ratio Worksheet:*
  This form should only be required when using the Tailored Method. The Room Cavity Ratio is required in the Tailored Method Worksheet.
- *LTG-8-C: Common Lighting Systems Method:*
  This form is only used when showing compliance using the Common Lighting Systems Method.
- *LTG-9-C: LINE VOLTAGE TRACK LIGHTING WORKSHEET:*
  This form is only used when line voltage track lighting is used.
- *OLTG-4-C: Worksheet for Signs:*
  See instructions for OLTG-4-C, Sign Worksheet in Chapter 6, Outdoor Lighting and Signs Chapter.

5.15.1 LTG-1-C: Certificate of Compliance

The LTG-1-C Certificate of Compliance form is in three parts. Each part; if required below must appear on the plans (usually near the front of the electrical drawings). A copy of these forms should also be submitted to the building department along with the rest of the compliance submittal at the time of building permit application. With building department approval, the applicant may use alternative formats of these forms (rather than the official Energy Commission forms), provided the information is the same and in a similar format.

LTG-1-C, Part 1 of 4 and 2 of 4 are required for all submittals. LTG-1-C, Part 3 of 4 submittal is only required if control credits are claimed.

Building Lighting Shut-off

The building lighting shut-off sys consists of an automatic time switch, with a zone for each floor.

Override for Building Lighting Shut-off

The automatic building shut-off system is provided with a manual accessible override switch in sight of the lights. The area of override is not to exceed 5,000 square feet.

Automatic Control Devices Certified

All automatic control devices specified are certified; all alternate equipment shall be certified and installed as directed by the manufacturer.

Fluorescent Ballast and Luminaires Certified

All fluorescent fixtures subject to certification and specified for the projects are certified.

Individual Room/Area Controls

Each room and area in this building is equipped with a separate switch or occupancy sensor device for each area with floor-to-ceiling walls.

Uniform Reduction for Individual Rooms

All rooms and areas greater than 100 square feet and more than 0.8 watts per square foot of lighting load shall be controlled with Multi-level switching for uniform reduction of lighting within the room.

Daylit Area Control

All rooms that are greater than 250 square feet and contain windows and skylights, that allow for the effective use of daylight in the area shall have 50% of the lighting power in each daylit area controlled by a separate switch; or

The effective use of daylight throughout cannot be accomplished because the windows are continuously shaded by a building on the adjacent lot. Diagram of shading during different times of year is included on plans.

The above notes are only examples of wording. Each mandatory measure that requires a separate note should be listed on the plans.

To verify certification, use one of the following options:

The Energy Hotline (1-800-772-3300) can verify certification of appliances not found in the above directories.

- The Energy Commission's Web Site includes listings of energy efficient appliances for several appliance types. The web site address is http://www.energy.ca.gov/efficiency/appliances/.
- The complete appliance databases can be downloaded from the California Energy Commission's Internet

(http://www.energy.ca.gov/appliances/appliance/excel_based_files/). This requires database software (spreadsheet programs cannot handle some of the larger files). To use the data, a user must download the database file (or files), download a brand file and a manufacturer file and then decompress these files. The data can be sorted and manipulated.

Documenting the mandatory measures on the plans is accomplished through a confirmation statement, notes and actual equipment location as identified on the plans. The plans should clearly indicate the location and type of all mandatory control devices; such as manual switches, reduced level control, daylit area, controls, building shut-off and overrides, and exterior light controls.

Lighting Worksheet

Check the appropriate boxes to indicate which worksheet(s) are being included with the certificate of compliance.

LTG-1-C Part 2 of 4

Part 2 of LTG-1-C is used to indicate compliance by showing that the installed indoor lighting power is lower than the lighting power allowance.

Installed Indoor Lighting Power for Conditioned and Unconditioned Spaces:

- Indicate the installed lighting for conditioned spaces from form LTG-2-C
- Indicate installed lighting power from LTG-2-C, portable lighting from LTG-2-C, and any lighting controls credits from LTG-4-C. Sum to determine total installed lighting power.
- Indicate lighting control credit for conditioned spaces form LTG-4-C
- Indicate the conditioned space adjusted installed lighting power
- Indicate the installed lighting for unconditioned spaces from LTG-2-C
- Indicate lighting control credit for unconditioned spaces from LTG-4-C
- Indicate the unconditioned space adjusted installed lighting power

Allowed Indoor Lighting Power

- Indicate which method of compliance is being used and indicate the total allowance from the corresponding worksheet.

Alternate Compliance

- Check the appropriate box if the performance or area category method is being used for compliance.

6. COLUMN F - is 5 times the product of the room cavity height H (from COLUMN E) and the sum of the room length and width (L from COLUMN C plus W from COLUMN D), all divided by the room area L (from COLUMN C) times room width (W from COLUMN D). This quantity is the RCR and should be entered in COLUMN D of Part 1 of LTG-6-C for tasks with illuminance categories A-G.

Non-rectangular Spaces

7. COLUMN A - lists each room's number, and should correspond with the plans.
8. COLUMN B - lists the area or activity description for the room. If the room has multiple tasks or activities, use the dominant activity for the room in this column.
9. COLUMN C - lists the interior area (A) of the room in square feet. This should be determined by whatever means appropriate for the shape of the room.
10. COLUMN D - lists the room perimeter (P) measured in feet along the interior surfaces of the walls that define the boundaries of the room. For rooms with angled walls, this is the sum of the interior lengths of each wall in the room. For circular rooms, this is the interior radius of the room, squared, times pi (3.413).
11. COLUMN E - lists the vertical distance, measured in feet, from the work plane to the center line of the lighting fixture. This measurement is called the room cavity height (H).
12. COLUMN F - is 2.5 times the product of the room cavity height H (from COLUMN E) and room perimeter P (from COLUMN D), all divided by the room area A (from COLUMN C). This quantity is the RCR and should be entered in COLUMN D of Part 1 of LTG-6-C for tasks with illuminance categories A-G.

5.15.8 LTG-8-C: Common Lighting Systems Method Worksheet

Complete and submit form LTG-8-C (Common Lighting Systems) only if selecting the Common Lighting Systems method of allowed lighting power to determine if an indoor lighting system complies with the prescriptive requirements (§146 in the Standards). This method is only for building types shown in Standards Table 146-B, Complete Building Method Lighting Power Density Values. In addition, the lighting power density listed in Standards Table 146-B for that building type must be at least 1.0 w/ft^2.

1. SPACE NAME -- Insert the name or number of the space. Use a new row for each space in the building area.
2. SPACE AREA -- Insert the area (square feet) of the space.
3. LUMINAIRE TYPE OR CODE -- Insert the luminaire type, or the luminaire code shown in the luminaire schedule on the plans.
4. LUMINAIRE POWER -- Insert the power used by each luminaire of the type shown on this line, in watts. This is the total power including the ballast or transformer (or lamp, if no ballast or transformer is required to operate that lamp) when operating the lamp.

Part 3 of 4. If this area overlaps any other illuminated application areas, then subtract any overlapping areas from the other application.

Sign Lighting Compliance

OLTG-4-C shall be used to document compliance of Internally Illuminated and Externally Illuminated sign compliance in §148. This form may be used with LTG-1-C for sign applications when no other regulated outdoor lighting systems are installed, or with OLTG-1-C for sign applications alone or sign applications in conjunction with other outdoor lighting applications.

There are two compliance options for signs. Alternative 1 is based on complying with lighting power allowances per square foot of sign. Alternative 2 is based on utilizing only specific lighting technologies. Unfiltered signs (signs consisting of bare lamps) are not regulated. For hybrid signs, consisting of one or more components of internally illuminated, externally illuminated, and unfiltered components, each regulated component shall comply with Standards separately.

1. COLUMN A - The code for each sign type, as it is described by name, type or symbol on the plans.
2. COLUMN B – List the quantity of signs that are included on this line. For example, if a project has multiple signs that are identical, they may be listed together on one line.
3. COLUMN C - Describes the location of the sign.
4. Fill in COLUMNS D through L only if Alternative 1 is being used for the sign or component compliance.
5. COLUMN D - The area of the sign in square feet.
6. COLUMN E - List “I” if the sign is internally illuminated, and list “E” if the sign is externally illuminated. If a sign has both internally and externally illuminated components, enter the sign components on separate lines.
7. COLUMN F - If the sign or sign component is internally illuminated, enter “12” watts per square foot, if the sign or sign component is externally illuminated, enter “2.3” watts per square foot.
8. COLUMN G - Calculate the allotted watts (COLUMNS D X F).
9. COLUMN H - Type lamp is the type of lamp (incandescent, fluorescent or high-intensity discharge, etc.).
10. COLUMN I - Enter either the number of identical lamps, or the total lineal feet of lamps in the sign or sign component.
11. COLUMN J is the number of ballasts in the sign.
12. COLUMN K -The total designed input watts for lighting the sign or component.
13. COLUMN L - Enter “Y” if COLUMN K is smaller than COLUMN G, the sign complies under Alternative 1. If COLUMN K is larger than COLUMN G, enter “N”, the sign does not comply

8.6.9 NJ.5.1 Air Distribution Acceptance

At-a-Glance

NJ.5.1 Air Distribution Acceptance
Use Form MECH-5-A

Purpose of the Test

The purpose of this test is to verify all duct work associated with all non-exempt constant volume, single-zone, HVAC units (i.e. air conditioners, heat pumps, and furnaces) meet the material, installation, and insulation R-values per §124(a) requirements of §144(k), including construction materials, installation, insulation R-values, and that duct leakage does not exceed the maximum allowable leakage fraction per §144(k) for new duct systems or §149(b)1D for existing duct systems.

As detailed in the Standard this test is only required for single-zone units serving 5,000 ft^2 of space or less where 25% or more of the duct surface area is in one of the following spaces:

- Outdoors, or
- In a space directly under a roof where the U-factor of the roof is greater than the U-factor of the ceiling, or
- In a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, or
- In an unconditioned crawlspace; or
- In other unconditioned spaces.

Within this criteria, this test applies to both new duct systems and to existing duct systems which are either being extended or the space conditioning system is altered by the installation or replacement of space conditioning equipment including: replacement of the air handler; outdoor condensing unit of a split system air conditioner or heat pump; cooling or heating coil; or the furnace heat exchanger. Existing duct systems do not have to be tested if they are insulated or sealed with asbestos.

Benefits of the Test

Duct construction and insulation can have adverse impacts on energy usage and duct-system durability. These are most acute where the ducts are located in unconditioned spaces or out of doors.

Instrumentation

Performance of this test will require measuring airflow. Equipment used:

- Fan flowmeter (a fan with a calibrated orifice used to pressurize the ducts) accuracy within 3% of measured flow. Contact CalCerts, CBPCA, or CHEERS for proper equipment.
- Digital manometer (pressure meter) accuracy within 0.2 Pascals.

Duct leakage tests must be verified by certified HERS rating agency certified by the California Energy Commission. There are currently three companies that certify HERS raters. They can be found at http://www.CalCerts.com, http://www.CBPCA.org/ or http://www.CHEERS.org.

- Certificate of Acceptance (3 pages)
- Lighting Control Acceptance Document
- Automatic Daylighting Controls Acceptance Document

LTG-1-A - Certificate of Acceptance Part 1 of 2

The form is separated into three basic sections: project information; general information; and statement of acceptance. Each section consists of a combination of data entry requirements and check boxes.

Project Information

- PROJECT NAME is the title of the project, as shown on the Code Compliance forms.
- DATE is the date of preparation of the compliance submittal package.
- PROJECT ADDRESS is the address of the project as shown on the Code Compliance forms.
- TESTING AUTHORITY is the person responsible for verifying all acceptance tests were performed and each system passed.
- TELEPHONE is the phone number where the testing authority can be reached during regular business hours.

General Information

This section consists of a combination of data entry requirements and check boxes, all of which are self explanatory. Complete check boxes and enter data as instructed.

Statement of Acceptance

- This section consists of a combination of check boxes and data entry requirements, including signature; date; and license number. Complete check boxes and enter data as instructed.

LTG-1-A - Certificate of Acceptance Part 2 of 2

The form is used to document the overall final results of all acceptance tests.

Summary of Acceptance Tests

- SYSTEM ACCEPTANCE DOCUMENT refers to the name of the test form that has been completed. For example: “Lighting Control Acceptance” document, LTG-2-A. This designates the acceptance test of type of lighting control designated #1 or name of control. Typically an individual form is completed for each piece of control tested.
- TESTING AUTHORITY is the person responsible for verifying all acceptance tests were performed and each system passed.

Appendix A
Compliance & Acceptance Forms

	Certificate of Compliance Forms and Worksheets		
Envelope	**Mechanical**	**Lighting**	**Outdoor Lighting**
ENV-1-C Certificate of Compliance **ENV-2-C** Envelope Component Method **ENV-3-C** Overall Envelope **Method** **ENV-4-C** Skylight Area Support Worksheet	**MECH-1-C** Certificate of Compliance **MECH-2-C** Air System, Water Side System, Service Hot Water & Pool Requirements **MECH-3-C** Mechanical Ventilation **MECH-4-C** HVAC Misc. Prescriptive Requirements	**LTG-1-C** Certificate of Compliance **LTG-2-C** Indoor Lighting Schedule LTG-3-C Portable Lighting Worksheet **LTG-4-C** Lighting Controls Credit Worksheet **LTG-5-C** Indoor Lighting Power Allowance **LTG-6-C** Tailored Method Worksheet **LTG-7-C** Room Cavity Ratio Worksheet **LTG-8-C** Common Lighting Systems Method **LTG-9-C** Line Voltage Track Lighting Worksheet	**OLTG-1-C** Certificate of Compliance **OLTG-2-C** Lighting Compliance Summary **OLTG-3-C** Illuminated Area Calculation Worksheet **OLTG-4-C** Sign Lighting Compliance
	Certificate of Acceptance Forms and Worksheets		
	Mechanical	**Lighting**	
No Acceptance Requirements Available	**MECH-1-A** Certificate of Acceptance **MECH-2-A** Ventilation Systems – Variable and Constant Volume **MECH-3-**A Packaged HVAC Systems **MECH-4-A** Economizer **MECH-5-A** Air Distribution **MECH-6-A** Demand Control Ventilation **MECH-7-A** Supply Fan VFD **MECH-8-A** Hydronic Systems Control	**LTG-1-A** Certificate of Acceptance **LTG-2-A** Lighting Controls **LTG-3-A** Automatic Daylighting	*No Acceptance Requirements Available*

CERTIFICATE OF COMPLIANCE (Part 2 of 2) ENV-1-C

Project Name	DATE

OPAQUE SURFACES

A	B	C	D	E		F	G	H	I	J	K
Surface Type	Construction Type	Area	U-factor	Insulation Cavity	Insulation Continuous	Actual Azimuth	Tilt	Condition Status*	Joint Appendix IV Reference	Location/Comments (e.g., Suspended Ceiling, Demising, etc.)	NOTES TO FIELD - For Building Dept. Use Only

* N, E, A, (New, Existing, Altered)

FENESTRATION SURFACES

✓ ☐ More than or equal to10,000 ft² of site-built fenestration area must include a label certificate issued by NFRC or provide a CEC Default Label Certificate using the default U-factors from Standards Tables 116-A and B. Certificate shall be filed in the contractor's project office during construction and in the building manager's office after construction.

A	B	C	D	E	F	G	H	I	J	K
Fenestration Name	Fenestration Type	Area	Azimuth	U-factor	U-factor Type[1] D A N	Fenestration SHGC	SHGC Type[2] D C N	Condition Status[3]	Location / Comments	NOTES TO FIELD – For Bldg. Dept. Use Only
	Window				☐☐☐		☐☐☐			
	Window				☐☐☐		☐☐☐			
	Window				☐☐☐		☐☐☐			
	Window				☐☐☐		☐☐☐			
	Window				☐☐☐		☐☐☐			
	Skylight				☐☐☐		☐☐☐			
	Skylight				☐☐☐		☐☐☐			
	Skylight				☐☐☐		☐☐☐			
	Skylight				☐☐☐		☐☐☐			
	Skylight				☐☐☐		☐☐☐			

[1] U-factor Type: D, A or N (D for Default Table from Section 116, A for ACM Manual Appendix Default Table, or N for NFRC Labeled)

[2] SHGC Type: D, C or N (D for Default Table from Section 116, C for Center of Glass, or N for NFRC).

[3] Condition Status: N, E, or A (New, Existing, or Altered)..

EXTERIOR SHADING

Fenestration Name	Exterior Shade Type	SHGC	Window Height	Window Width	Overhang Length	Overhang Height	LExt.	RExt.

MINIMUM SKYLIGHT AREA FOR LARGE ENCLOSED SPACES

✓ ☐ The proposed building is in *climate zones 2 through 15* and contains an enclosed space with floor area greater than 25,000 ft^2, a ceiling height greater than 15 feet, and an LPD for general lighting of at least 0.5 W/ft^2. See Section 143(c). **If this box is checked, ENV-4-C must be filled out.**

NOTES TO FIELD - For Building Department Use Only

OVERALL ENVELOPE METHOD (Part 1 of 7) ENV-3-C

Project Name	DATE

WINDOW AREA CALCULATION

A. DISPLAY PERIMETER		FT × 6 FT =	SF	DISPLAY AREA
B. GROSS EXTERIOR WALL AREA		SF × 0.40 =	SF	40% of GROSS EXTERIOR WALL AREA
C. ENTER LARGER OF A OR B			SF	MAXIMUM STANDARD AREA
D. ENTER PROPOSED WINDOW AREA			SF	PROPOSED AREA
E. WINDOW WALL RATIO = Proposed Window Area Divided by Gross Exterior Wall Area =				
F. WEST DISPLAY PERIMETER		FT × 6 FT =	SF	WEST DISPLAY AREA
G. WEST EXTERIOR WALL AREA		SF × 0.40 =	SF	40% of WEST EXTERIOR WALL AREA
H. ENTER THE LARGER OF F AND G			SF	MAXIMUM STANDARD WEST AREA
I. ENTER PROPOSED WEST WINDOW AREA			SF	PROPOSED WEST WINDOW AREA
J. WEST WINDOW WALL RATIO = Proposed West Window Area Divided by West Exterior Wall Area =				
Combined Values for North, East and South Walls				
K. N/E/S DISPLAY PERIMETER (A - F)		FT × 6 FT =	SF	N/E/S DISPLAY AREA
L. N/E/S EXTERIOR WALL AREA (B - G)		SF × 0.40 =	SF	40% N/E/S AREA
M. ENTER LARGER OF K OR L			SF	MAXIMUM STANDARD N/E/S AREA
N. PROPOSED N/E/S WINDOW AREA (D - I)			SF	PROPOSED N/E/S AREA

Window adjustment

O. IF D>C and/or if I>H, PROCEED TO THE CALCULATION STEPS 1 OR 2 BELOW, AS APPROPRIATE, FOR WINDOW AREA ADJUSTMENT. IF NOT, GO TO THE SKYLIGHT AREA TEST IN PART (7 of 7).

1. IF I<H: Use the calculated Window Adjustment Factor (WAF) for all walls.

MAX. STANDARD AREA (from C)		PROPOSED WINDOW AREA (from D)		WINDOW ADJUSTMENT FACTOR
	÷		=	

GO TO PART 7 TO CALCULATE ADJUSTED AREAS

2. IF I>H: Calculate one Window Adjustment Factor (WAF) for the West wall, and a second WAF for all other orientations.

a. Calculate the WAF for the West wall.

MAX. STANDARD WEST AREA (from H)		PROPOSED WEST AREA (from I)		WEST WINDOW ADJUSTMENT FACTOR
	÷		=	

b. Calculate the WAF for the North, East and South walls.

MAX. STANDARD N/E/S AREA (from M)		PROPOSED N/E/S AREA (from N)		N/E/S WINDOW ADJUSTMENT FACTOR
	÷		=	

GO TO PART 7 TO CALCULATE ADJUSTED AREAS

OVERALL ENVELOPE METHOD (Part 5 of 7) ENV-3-C

Project Name	DATE

ROOF ABSORPTANCE CALCULATION: Use this table to determine the value of the absorptance for the proposed design, α_{prop}

See Section 3.7.3 Roof Absorptance Calculation

✓ CHECK APPLICABLE BOXES	YES		NO		
1. CRRC-1 Certified?	☐	Go to 2.	☐	Go to 3.	
2. Is the thermal emittance ≥ 0.75?	☐	Go to 4.	☐	Go to 6.	
3. Is the roof a nonresidential low sloped roof? (2:12 of less)	☐	Go to 9.	☐	Go to 10.	
4. Enter the initial reflectance $\rho_{Ri,prop}$ value	$\rho_{Ri,prop}$ =		Go to 5. Insert value in calculation		
5. Calculate $\alpha_{prop} = 0.94-0.7\rho_{Ri,prop}$	α_{prop} =		Is the roof a nonresidential low sloped roof? (2:12 of less)	Y ☐	N ☐

Case 2 - CRRC-1 Tested				
6.Enter initial reflectance & emittance values from CRRC-1	ρ_{init} =	ε_{init} =	Go to 7. Insert values in calculation	
7. Calculate $\rho_{Ri,prop} = -0.448 + 1.121\ \rho_{init} + 0.524\ \varepsilon_{init}$	$\rho_{Ri,prop}$ =			
8. Calculate $\alpha_{prop} = 0.94-0.7\rho_{Ri,prop}$	α_{prop} =		Is the roof a nonresidential low sloped roof? (2:12 of less)	Y ☐ N ☐

Case 3 - Not CRRC-1 Tested		
9. Use the default values for absorptance, α_{prop}	α_{prop} = 0.87	Enter default value in Column F below.
10. Use the default values for absorptance, α_{prop}	α_{prop} = 0.73	Enter default value in Column F below.

Standard absorptance values α_{std}, for Column J are either		
For nonresidential low-sloped roofs	α_{std} = 0.45	Enter standard value in Column J below.
For nonresidential high-sloped roofs	α_{std} = 0.73	Enter standard value in Column J below.

OVERALL HEAT GAIN FROM RADIATION OPAQUE SURFACES

A	B	C	D	E	F	G	H	I	J	K
	PROPOSED						STANDARD			
ASSEMBLY NAME (e.g. Roof-1)	AREA	SOLAR FACTOR	WEIGHT FACTOR	U - FACTOR	Absorp α	HEAT GAIN (BxCxDxExF)	AREA (Adjusted)	U-FACTOR	Absorp α	HEAT GAIN (C×DxH×IxJ)
	SUBTOTAL									SUBTOTAL

Subtotals are entered under "Subtotal" in COLUMNS I and M of ENV-3-C, Part 6 of 7.

CERTIFICATE OF COMPLIANCE (Part 4 of 4) LTG-1-C

PROJECT NAME Please input name on LTG1 page 1	DATE

Designer:

This form is to be used by the designer and attached to the plans. Listed below are all the acceptance tests for lighting systems. The designer is required to check the boxes by all acceptance tests that apply and list all equipment that require an acceptance test. If all equipment of a certain type requires a test, list the equipment description and the number of systems to be tested in parentheses. The NJ number designates the Section in the Appendix of the Nonresidential ACM Manual that describes the test. Also indicate the person responsible for performing the tests (i.e. the installing contractor, design professional or an agent selected by the owner). Since this form will be part of the plans, completion of this section will allow the responsible party to budget for the scope of work appropriately.

Building Departments:

Systems Acceptance. Before an occupancy permit is granted for a newly constructed building or space, or a new space-conditioning system serving a building or space is operated for normal use, all control devices serving the bu or space shall be certified as meeting the Acceptance Requirements for Code Compliance. In addition a Certificate of Acceptance, LTG-1-A, Forms shall be submitted to the building department that:

A. Certifies plans, specifications, installation certificates, and operating and maintenance information meet the requirements of §10-103(b) and Title 24 Part 6.

Test Description	Test Performed By:
☐ LTG-2-A: Lighting Control Acceptance Document • Occupancy Sensor Acceptance • Manual Daylight Controls Acceptance • Automatic Time Switch Control Acceptance **Equipment requiring acceptance testing:**	
☐ LTG-3-A: Automatic Daylighting Controls Acceptance Document **Equipment requiring acceptance testing:**	
☐	
☐	
☐	
☐	

INDOOR LIGHTING SCHEDULE (Part 2 of 2) LTG-2-C

PROJECT NAME Please input name on LTG1 page 1 | DATE

INSTALLED LIGHTING POWER FOR UNCONDITIONED SPACES

Luminaire		Lamps/Ballasts				Installed Watts			
A	B	C	D	E	F	G	H	I	J
Name	Type Description	Lamp Type	Number of Lamps per Luminaire	Watts per Lamp	Number of Ballast per Luminaire	Watts per Luminaire	✓ if CEC Default	Number of Luminaires	Installed Watts (G x I)
							☐		
							☐		
							☐		
							☐		
							☐		
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							☐		

PAGE TOTAL

BUILDING TOTAL (sum of all pages)

CONTROL CREDIT (from LTG-4-C —

ADJUSTED ACTUAL WATTS =

LINE VOLTAGE TRACK LIGHTING WORKSHEET LTG-9-C

PROJECT NAME	DATE

✓ ☐ METHOD 1 – VOLT-AMPERE (VA) RATING OF THE BRANCH CIRCUIT OR WATTAGE OF THE CURRENT LIMITERS - ONLY CURRENT LIMITERS CERTIFIED TO THE COMMISSION CAN BE USED WITH THIS METHOD

A	B	C	D	E	F	G
Branch Circuit Option		Current Limiter Option				
BRANCH CIRCUIT NAME OR ID	VOLT-AMPERE (VA) RATING OF THE BRANCH CIRCUIT (Fill this column only if branch circuit option is used for compliance)	TRACK EQUIPPED WITH CURRENT LIMITER (CL)? (Columns C thru G may be left blank if the branch circuit option is used for compliance) ✓ IF YES	IF COLUMN (C) IS YES, LIST CURRENT LIMITER WATTAGE (W)	TRACK LENGTH (FT)	MULTIPLY TRACK LENGTH (E) BY 15 W/LF IF THERE IS CL, OR 45 W/LF IF THERE IS NO CL (W)	TRACK WATTAGE – HIGHER OF COLUMNS (D) OR (F) (W)
		☐				
		☐				
		☐				
		☐				
		☐				
SUB-TOTAL WATTS FOR TRACKS ON BRACH CIRCUIT – USE COLUMN (B) VA IF BRANCH CIRCUIT METHOD IS USED, OR TOTAL OF TRACK WATTS IN COLUMN (G) IF THE CL METHOD IS USED						
		☐				
		☐				
		☐				
		☐				
		☐				
SUB-TOTAL WATTS FOR TRACKS ON BRACH CIRCUIT – USE COLUMN (B) VA IF BRANCH CIRCUIT METHOD IS USED, OR TOTAL OF TRACK WATTS IN COLUMN (G) IF THE CL METHOD IS USED						
		☐				
		☐				
		☐				
		☐				
		☐				
SUB-TOTAL WATTS FOR TRACKS ON BRACH CIRCUIT – USE COLUMN (B) VA IF BRANCH CIRCUIT METHOD IS USED, OR TOTAL OF TRACK WATTS IN COLUMN (G) IF THE CL METHOD IS USED						
TOTAL WATTS – ADD ALL SUBTOTALS						

✓ ☐ METHOD 2 – USE THE HIGHER OF: 45 WATTS / LINEAR FOOT OF TRACK – OR TOTAL RATED WATTAGE OF ALL LUMINAIRES

A	B	C	D	E	F
TRACK # OR NAME	LINEAR FEET OF TRACK	(W/LF)	B x C (W)	TOTAL RATED WATTAGE OF ALL LUMINAIRES	LARGER OF (D or E)
		45			
		45			
		45			
		45			
		45			
		45			
				TOTAL	

SIGN LIGHTING COMPLIANCE **OLTG-4-C**

Project Name	Please input Project Name on page one of OLTG-1-C	DATE	

			Alternative 1 – Lighting Power Allowances									Alternative 2 – For Signs that ONLY use one or more of the technologies listed in M through S (Check all that apply)						
A	**B**	**C**	**D**	**E**	**F**[1]	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**
			Allotted Watts				**Lamp / Ballast**			**Design Watts**								
Sign Symbol or Code	Quantity of Signs	Description or Location	Sign Area (ft^2)	Internally (I) OR Externally (E) Illuminated	Allotted LPD (12 or 2.3) (W / ft2)	Allotted Watts (D X F)	Lamp Type	Number of OR Lineal Feet of Lamps	Number of Ballasts In Signs	Total Designed Sign Input watts	Is K ≤ G? Y / N	High Pressure Sodium	Pulse Start or Ceramic Metal Halide	Neon and Cold Cathode	Light Emitting Diode (LED)	Barrier Coat Fluorescent Lamps (includes most T5 and T8 lamps)	CFLs not containing Medium Screw Base Sockets	Electronic Ballasts with Output Frequency of 20kHz or more
												☐	☐	☐	☐	☐	☐	☐
												☐	☐	☐	☐	☐	☐	☐
												☐	☐	☐	☐	☐	☐	☐
												☐	☐	☐	☐	☐	☐	☐
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												☐	☐	☐	☐	☐	☐	☐
												☐	☐	☐	☐	☐	☐	☐
												☐	☐	☐	☐	☐	☐	☐

F[1] For Allotted LPD use 12 watts/square foot for Internally Illuminated Signs, and use 2.3 watts/ft^2 for Externally Illuminated Signs.

Note: If an Internally Illuminated or Externally Illuminated sign contains light sources and ballasts other than those included in columns (M) through (S), such as incandescent lamps, medium base sockets, magnetic ballasts, etc, then the sign must comply under Alternative 1. However, unfiltered signs, and unfiltered portions of Internally and Externally illuminated signs, are not required to meet these Standards.

CERTIFICATE OF COMPLIANCE (Part 1 of 3) MECH-1-C

PROJECT NAME	DATE	
PROJECT ADDRESS		Building Permit Checked by/Date Enforcement Agency Use
PRINCIPAL DESIGNER-MECHANICAL	TELEPHONE	
DOCUMENTATION AUTHOR	TELEPHONE	

GENERAL INFORMATION

DATE OF PLANS	BUILDING CONDITIONED FLOOR AREA	CLIMATE ZONE

BUILDING TYPE	☐ NONRESIDENTIAL	☐ HIGH RISE RESIDENTIAL	☐ HOTEL/MOTEL GUEST ROOM
PHASE OF CONSTRUCTION	☐ NEW CONSTRUCTION	☐ ADDITION ☐ ALTERATION	☐ UNCONDITIONED (FILE AFFIDAVIT)
PROOF OF ENVELOPE COMPLIANCE	☐ PREVIOUS ENVELOPE PERMIT		☐ ENVELOPE COMPLIANCE ATTACHED

STATEMENT OF COMPLIANCE

This Certificate of Compliance lists the building features and performance specifications needed to comply with Title 24, Parts 1 and 6 of the California Code of Regulations. This certificate applies only to building mechanical requirements.

The documentation preparer hereby certifies that the documentation is accurate and complete.

DOCUMENTATION AUTHOR	SIGNATURE	DATE

The Principal Mechanical Designer hereby certifies that the proposed building design represented in this set of construction documents is consistent with the other compliance forms and worksheets, with the specifications, and with any other calculations submitted with this permit application. The proposed building has been designed to meet the mechanical requirements contained in the applicable parts of Sections 100, 101, 102, 110 through 115, 120 through 125, 142, 144 and 145.

☐ The plans & specifications meet the requirements of Part 1 (10-103a).

☐ The installation certificates meet the requirements of Part 1 (10-103a 3).

☐ The operation & maintenance information meets the requirements of Part 1 (10-103c).

Please check one: (These sections of the Business and Professions Code are printed in full in the Nonresidential Manual.)

☐ I hereby affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code to sign this document as the person responsible for its preparation; and that I am licensed in the State of California as a civil engineer or mechanical engineer, or I am a licensed architect.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code by Section 5537.2 or 6737.3 to sign this document as the person responsible for its preparation; and that I am a licensed contractor performing this work.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code to sign this document because it pertains to a structure or type of work described pursuant to Business and Professions Code sections 5537, 5538, and 6737.1.

PRINCIPAL MECHANICAL DESIGNER-NAME	DATE	LIC. #

INSTRUCTIONS TO APPLICANT MECHANICAL COMPLIANCE & WORKSHEETS (check box if worksheet is included)	
☐ MECH-1-C	Certificate of Compliance. Part 1 of 3, 2 of 3, 3 of 3 are required on plans for all submittals
☐ MECH-2-C	Air/Water/Service/Water Pools Requirements. Part 1 of 3, 2 of 3, 3 of 3 are required for all submittals, but may be on plans.
☐ MECH-3-C	Mechanical Ventilation and Reheat is required for all submittals with mechanical ventilation, but may be on plans.
☐ MECH-4-C	HVAC Miscellaneous Prescriptive Requirements is required for all prescriptive submittals, but may be on plans.

MECHANICAL VENTILATION AND REHEAT — MECH-3-C

Project Name: | DATE:

MECHANICAL VENTILATION (§121(b)2)									REHEAT LIMITATION (§144(d))				
AREA BASIS				OCCUPANCY BASIS					VAV Minimum				
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Zone / System	Condition Area (ft sq)	CFM per (ft sq)	Min CFM by Area (B x C)	Num of People	CFM per Person	Min CRM by Occupant (E x F)	REQ'D V.A. Max of E or G	Design Ventilation Air cfm	30% of Design Zone Supply cfm	B x 0.4 cfm/ft²	Max of Columns H, J, K, or 300 cfm	Design minimum Air setpoint	Transfer Air
					15								
					15								
					15								
					15								
					15								
					15								
					15								
					15								
					15								
					15								
					15								
					15								
			Totals								Column I Total Design Ventilation Air		

C	Minimum ventilation rate per Section §121, Table 121-A.
E	Based on fixed seat or the greater of the expected number of occupants and 50% of the CBC occupant load for egress purposes for spaces without fixed seating.
H	Required Ventilation Air (REQ'D V.A.) is the larger of the ventilation rates calculated on an AREA BASIS or OCCUPANCY BASIS (Column D or G).
I	Must be greater than or equal to H, or use Transfer Air (column N) to make up the difference.
J	Design fan supply cfm (Fan CFM) x 30%; or
K	Condition area (ft²) x 0.4 cfm/ft²; or
L	Maximum of Columns H, J, K, or 300 cfm
M	This must be less than or equal to Column L and greater than or equal to sum of Columns H plus N.
N	Transfer Air must be provided where the Required Ventilation Air (Column I) is greater than the Design Minimum Air (Column M). Where required, transfer air must be greater than or equal to the difference between the Required Ventilation Air (Column H) and the Design Minimum Air (Column I), Column H minus M.

HVAC MISC. PRESCRIPTIVE REQUIREMENTS: MECH-4-C

PROJECT NAME		DATE	

FAN POWER CONSUMPTION §144(c)

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Volume Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach.

A	B	C	D	E	F
		EFFICIENCY			
FAN DESCRIPTION	**DESIGN BRAKE HP**	**MOTOR**	**DRIVE**	**NUMBER OF FANS**	**PEAK WATTS B x E x 746 / (C x D)**

	Total Adjustments		
FILTER PRESSURE ADJUSTMENT Equation. 144-A	1) Total Fan System Power (Peak Watts, Sum of Column F)		
A) If filter pressure drop is greater than 1 inch W. C. enter filter pressure drop. SP_a on line 4 and Total Fan pressure SP_f on Line 5.	2) Supply Design Airflow (CFM)		
	3) Total Fan System Power Index (Row1/Row2)[1] W/cfm		
B) Calculate Fan Adjustment and enter on line 6.	4) SP_a		
	5) SP_f		
C) Calculate Adjusted Fan Power Index and enter on Row 7	6) Fan Adjustment = $1-(SP_a - 1)/SP_f$		
	7) Adjusted Fan Power Index (Line 3 x Line 6)[1] W/cfm		

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 w/cfm, for Constant Volume systems or 1.25 w/cfm for VAV systems

ITEM or SYSTEM TAG(S)				
PRESCRIPTIVE MEASURES	***T-24 Section***	**Capacity**	**Exception**	***Notes***
Electric Resistance Heating[1]	§144 (g)			
Heat Rejection System[2]	§144 (h)			
Air Cooled Chiller Limitation[3]	§144 (i)			

1. Total installed capacity (MBtu/hr) of all electric heat on this project exclusive of electric auxiliary heat for heat pumps. If electric heat is used explain which exception(s) to §144(g) apply.
2. Are centrifugal fan cooling towers used on this project? (Enter "Yes" or "No") If centrifugal fan cooling towers are used explain which exception(s) to §144(h) apply.
3. Total installed capacity (tons) of all chillers and air cooled chillers under this permit, If there are more than 100 tons of air-cooled chiller capacity being installed explain which exception(s) to §144(i) apply.

2005 CERTIFICATE OF ACCEPTANCE (Part 1 of 2) LTG-1-A

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	Checked by/Date Enforcement Agency Use

GENERAL INFORMATION

DATE OF BLDG. PERMIT	PERMIT #	BLDG. CONDITIONED FLOOR AREA	CLIMATE ZONE
BUILDING TYPE	☐ NONRESIDENTIAL	☐ HIGH RISE RESIDENTIAL	☐ HOTEL/MOTEL GUEST ROOM
PHASE OF CONSTRUCTION	☐ NEW CONSTRUCTION	☐ ADDITION ☐ ALTERATION	☐ UNCONDITIONED

STATEMENT OF ACCEPTANCE

This Certificate of Acceptance summarizes the results of the acceptance tests related to building lighting requirements per Title 24, Part 1 (10-103(b)) and Part 6. (Sections 119(d), 119(e), 131(d))

Please check one:

☐ I hereby affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code to sign this document as the person responsible for it's preparation; and that I am licensed in the State of California as a civil engineer or electrical engineer, or I am a licensed architect.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code by Section 5537.2 or 6737.3 to sign this document as the person responsible for its preparation; and that I am a licensed contractor performing this work.

☐ I affirm that I am eligible under the exemption to Division 3 of the business and Professions Code to sign this document because it pertains to a structure or type of work described pursuant to Business and Professions Code sections 5537, 5538, and 6737.1.

(These sections of the Business and Professions Code are printed in full in the Nonresidential Manual.)

TESTING AUTHORITY - NAME	SIGNATURE	DATE	LIC.#

INSTRUCTIONS TO APPLICANT

For Detailed instructions on the use of this and all Energy efficiency Standards acceptance forms, please refer to the Nonresidential Manual published by the California Energy Commission.

Part 1 of 2 - Statement of Acceptance

Part 2 of 2 - Summary of Acceptance Tests

Ventilation System Acceptance Document

NJ.3.1, NJ.3.2

Form __of __

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
VENTILATION SYSTEM NAME / DESIGNATION		_____ Checked by/Date Enforcement Agency Use

Intent: Verify measured outside airflow CFM is within ± 10% of the total required outside airflow value found in the Standards Mechanical Plan (MECH-3-C, Column H or Column I), per 121(f).

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. Watch
   b. Means to measure airflow (hot wire anemometer or pitot tube)

2 Check one of the following:

☐ Variable Air Volume (VAV) - Check as appropriate:
   a. Sensor used to control outdoor air flow must have calibration certificate or be field calibrated
      ☐ Calibration certificate (attach calibration certification)
      ☐ Field calibration (attach results)

☐ Constant Air Volume (CAV) - Check as appropriate:
   ☐ System is designed to provide a fixed minimum OSA when the unit is on

Certification Statement: I certify that all statements are true on this MECH-2-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

Ventilation System Acceptance Document

NJ.3.1, NJ.3.2

Form __of __

PROJECT NAME	DATE

A. Equipment Testing (Check appropriate column)			CAV	VAV
a.		Verify unit is not in economizer mode during test - check appropriate column		
Step 1: CAV and VAV testing at full supply airflow				
	1	Drive boxes open (check)		
	2	Measured outdoor airflow (cfm)		
	3	Required outdoor airflow (cfm) *(from MECH-3-C, Column I)*		
	4	Time for outside air damper to stabilize after VAV boxes open (minutes)		
	5	Return to initial conditions (check)		
Step 2: VAV testing at reduced supply airflow				
	1	Drive boxes to minimum (check)		
	2	Measured outdoor airflow (cfm)		
	3	Required outdoor airflow (cfm) *(from MECH-3-C, Column I)*		
	4	Time for outside air damper to stabilize after VAV boxes open (minutes)		
	5	Return to initial conditions (check)		

B. Testing Calculations & Results	CAV	VAV
Step 1: % Outdoor Air = Measured outside air /Required outside air (Step1:2/Step1:3)	%	%
90% > %Outdoor Air < 110%	Y / N	Y / N
Outside air damper position stabilizes within 15 minutes (Step 1:4 < 15 minutes)	Y / N	Y / N
Step 2: % Outdoor Air = Measured outside air /Required outside air (Step2:2/Step2:3)		
90% > %Outdoor Air < 110%		Y / N
Outside air damper position stabilizes within 15 minutes (Step 2:4 < 15 minutes)		Y / N

Note: Shaded boxes do not apply for that particular test procedure

C. PASS / FAIL Evaluation (check one):	
☐	PASS: All **Construction Inspection** responses are complete and **Testing Calculations & Results** responses are positive (Y - yes)
☐	FAIL: Any **Construction Inspection** responses are incomplete *OR* there is one or more negative (N - no) responses in **Testing Calculations & Results** section. Provide explanation below. Use and attach additional pages if necessary.

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE MECH-3-A

Packaged/Split HVAC Systems Acceptance Document

NJ.4.1 **Form _____ of _____**

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
PACKAGED HVAC NAME / DESIGNATION		_____ Checked by/Date Enforcement Agency Use

Intent: Verify that under a specific load whether in occupied or unoccupied condition, the system meets a specific sequence of operation.

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. None required

2 Installation
   ☐ Thermostat or zone temperature sensor is located within the zone that the HVAC system serves
   ☐ Thermostat or sensor is wired to the HVAC system correctly

3 Programming (check **all** of the following)
   ☐ Heating and cooling thermostats are capable of a 5°F deadband where cooling and heating are at a minimum (§122(b)3)
   ☐ Occupied, unoccupied, and holiday schedule have been programmed.
   ☐ Pre-occupancy purge (at least lesser of minimum outside air or 3 ACH for one hour prior to occupancy) programmed (§121(c)2)
   ☐ Set up and set back setpoints have been programmed as required

Certification Statement: I certify that all statements are true on this MECH-3-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE MECH-3-A

Packaged/Split HVAC Systems Acceptance Document

NJ.4.1 **Form _____ of _____**

PROJECT NAME	DATE

B. Equipment Testing Requirements — **Operating Modes**

Check and verify the following for each simulation mode required		A: Heating load during occupied condition	B: No-load during unoccupied condition	C: Heating load during unoccupied condition	D: Manual override	E: Cooling load during occupied condition	F: Cooling load during unoccupied condition	G
	1 Supply fan operates continually	☐	☐			☐	☐	
	2 Supply fan turns off				☐			
	3 Supply fan cycles on and off			☐				☐
	4 System reverts to "occupied" mode to satisfy any condition					☐		
	5 System turns off when manual override time period expires					☐		
	6 Gas-fired furnace, heat pump, or electric heater stages on	☐		☐				
	7 Neither heating or cooling is provided by the unit		☐		☐			
	8 No heating is provided by the unit		☐		☐		☐	☐
	9 No cooling is provided by the unit	☐	☐	☐	☐			
	10 Compressor stages on						☐	☐
	11 Outside air damper is open to minimum position	☐	☐			☐	☐	
	12 Outside air damper closes completely				☐			
	13 System returned to initial operating conditions after all tests have been completed: Y/N							

C. Testing Results	A	B	C	D	E	F	G
Indicate if Passed (P), Failed (F), or N/A (X), fill in appropriate letter							

Note: Shaded areas do not apply for particular test procedure

D. PASS / FAIL Evaluation (check one):

☐ PASS: All **Construction Inspection** responses are complete and all applicable **Testing Results** responses are "Passed" (P)

☐ FAIL: Any **Construction Inspection** responses are incomplete *OR* there is one or more "Failed" (F) responses in **Testing Results** section. Provide explanation below. Use and attach additional pages if necessary.

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE MECH-5-A

NJ.5.1Air Distribution Acceptance Document (Part 1 of 3)

PROJECT NAME	DATE	TELEPHONE
PROJECT ADDRESS		
TESTING AUTHORITY		
AIR DISTRIBUTOR NAME / DESIGNATION	PERMIT NUMBER	Checked by/Date Enforcement Agency Use

Intent:	New single zone supply duct must be less than 6% leakage rate per §144(k) or §149(b)Di, existing single zone ductwork must be less than 15% leakage or other compliance path per §149(b)Dii or §149(b)E.

Construction Inspection

1	Scope of test – New Buildings – this test required on New Buildings only if all checkboxes 1(a) through 1(c) are checked	
	Existing Buildings – this test required if 1(a) through 1(d) are checked	
	Ductwork conforms to the following (note if any of these are not checked, then this test is not required):	
	☐	1a) Connected to a constant volume, single zone air conditioners, heat pumps, or furnaces
	☐	1b) Serves less than 5000 square feet of floor area
	☐	1c) Has more than 25% duct surface area located in one or more of the following spaces
		- Outdoors
		- A space directly under a roof where the U-factor of the roof is greater than U-factor of the ceiling
		- A space directly under a roof with fixed vents or openings to the outside or unconditioned spaces
		- An unconditioned crawlspace
	☐	- Other unconditioned spaces 1d) A duct is extended or any of the following replaced: air handler, outdoor condensing unit of a split system, cooling or heating coil, or the furnace heat exchanger.
2	Instrumentation to perform test includes:	
	a. Duct Blaster	
3	Material and Installation. Complying new duct systems shall have a checked box for all of the following categories a through f.	
	a. Choice of drawbands (check one of the following)	
	☐	Stainless steel worm-drive hose clamps
	☐	UV-resistant nylon duct ties
☐	b. Flexible ducts are not constricted in any way	
☐	c. Duct leakage tests performed before access to ductwork and connections are blocked	
☐	d. Joints and seams are not sealed with cloth back rubber adhesive tape unless used in combination with Mastic and drawbands	
☐	e. Duct R-values are verified R-8 per 124(a)	
☐	f. Ductwork located outdoors has insulation that is protected from damage and suitable for outdoor service	

Certification Statement

I certify that all statements are true on this MECH-5-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name:		
Company:		
Signature:		Date:

INSTALLER CERTIFICATION (Part 2 of 3) MECH-5-A

PROJECT NAME	DATE
SITE ADDRESS	PERMIT NUMBER

COPY TO: Building Department, Builder, Building Owner at Occupancy, HERS Provider

VERIFIED DUCT TIGHTNESS BY INSTALLER

The installing contractor must pressure test every new HVAC systems that meet the requirements of Section 144(k) and every retrofit to existing HVAC systems that meet the requirements of section 149(b)D or E (see Scope of Test under Construction Inspection)

RATED FAN FLOW (applies to all systems)		Measured Values	
1	Cooling capacity or for heating only units heating capacity		
	a) Cooling capacity (for all units but heating only units) in tons		
	b) Heating capacity (for heating only units) kBtu/h		
2	Fan flow calculation a) Cooling capacity in tons [_____(**Line # 1a**) x 400 cfm/ton] b) Heating only cap. kBtu/h [_____(**Line # 1b**) x (21.7 cfm/kBtu/h)]		
3	**Total calculated supply fan flow 2(a) or 2(b) cfm**		

NEW CONSTRUCTION OR ENTIRE NEW DUCT SYSTEM ALTERATION:			
	Duct Pressurization Test Results (CFM @ 25 Pa)		
4	Enter Tested Leakage Flow in CFM:		✓ ✓
5	Pass if Leakage Percentage <6%: [_____(**Line # 4**) /_____(**Line # 3**)] x 100	%	☐ Pass ☐ Fail
ALTERATIONS: Pre-existing Duct System with Duct Alteration and/or HVAC Equipment Change-Out			
6	Enter Tested Leakage Flow in CFM: **Pre-Test** of Existing Duct System Prior to Duct System Alteration and/or Equipment Change-Out.		
7	Enter Tested Leakage Flow in CFM: **Final Test** of New Duct System or Altered Duct System for Duct System Alteration and/or Equipment Change-Out.		
TEST OR VERIFICATION STANDARDS: For Altered Duct System and/or HVAC Equipment Change-Out Use one of the following Three Tests or Verification Standards for compliance:			
			✓ ✓
8	Pass if Leakage Percentage <15% [_____**(Line # 7)** / _____**(Line # 3)**] x 100	%	☐ Pass ☐ Fail
9	Pass if Leakage Reduction Percentage >60% Leakage reduction = [1 - [_____**(Line#7)** / _____**(Line#6)**]} x 100	%	☐ Pass ☐ Fail
10	Pass if all Accessible Leaks are sealed as confirmed by Visual Inspection and Verification by HERS rater (sampling rate 100%)		☐ Pass ☐ Fail
	Pass if One of Lines #8 through # 10 pass		☐ Pass ☐ Fail

INSTALLER COMPLIANCE STATEMENT

The building was: ✓ ☐ Tested at Final ☐ Tested at Rough-in

✓ ☐ I, the undersigned, verify that the above diagnostic test results and the work I performed associated with the test(s) is in conformance with the requirements for compliance credit. I, the undersigned, also certify that the newly installed or retrofit Air-Distribution System Ducts, Plenums and Fans comply with Mandatory requirements specified in Section 124 of the 2005 Building Energy Efficiency Standards.

Name:			
Company:			
Signature:		Date:	
License:		Expires:	

INSTALLER CERTIFICATION (Part 3 of 3) MECH-5-A

HERS Rater: Telephone:	Sample Group Number:
Certifying Signature:	Sample building Number:
Firm:	HERS Provider:
Copies to: Builder, Building Owner at Occupancy, Building Department (wet signature), HERS Provider	

For new buildings the HERS rater must test and field verify the first individual single zone package space conditioning equipment unit of each building. After the first unit passes the builder shall identify a group of up to seven package units in the building from which one sample will be selected for testing. If this first sampled unit fails the HERS rater must pick another package unit from the group for testing. If the second unit in the group does not pass the HERS rater must test all package units in the group.

For existing buildings the HERS rater must pressure test one out of every seven units a contractor changes. Same rules apply for sampling above.

This page must be filled out by the HERS rater for all tested and sampled buildings. If the installer has not tested every system and provided a MECH-5-A to the HERS rater sampling must not occur.

The unit was: ✓ ☐ Tested ✓ ☐ Approved as part of sample testing but was not tested

As the HERS rater providing diagnostic testing and field verification, I certify that the building identified on this form complies with the diagnostic tested compliance requirements as checked ✓ on this form. The HERS rater must verify the distribution system on every new TESTED system to make sure that it is fully ducted and correct tape is used before a MECH-5-A may be released.

☐ The installer has provided a completed MECH-5-A for every system in the group

☐ In new duct systems, where cloth backed, rubber adhesive duct tape is installed, mastic and draw bands are used in combination with cloth backed, rubber adhesive duct tape to seal leaks at duct connections.

	RATED FAN FLOW (applies to all systems)	Measured Values	
1	Cooling capacity or for heating only units heating capacity		
	a) Cooling capacity (for all units but heating only units) [_____ tons x 400 cfm/ton]		
	b) Heating capacity (for heating only units) [_____ kBtuh x 21.7 cfm/kBtuh]		
2	**Total calculated supply fan flow 1(a) or 1(b) cfm**		

	NEW CONSTRUCTION OR ENTIRE NEW DUCT SYSTEM ALTERATION:		
3	Duct Pressurization Test Results (CFM @ 25 Pa) Enter Tested Leakage Flow in CFM:		✓ ✓
4	Pass if Leakage Percentage <6%: [_____(**Line # 3**) / _____(**Line # 2**)] x 100	%	☐ Pass ☐ Fail
	ALTERATIONS: Pre-existing Duct System with Duct Alteration and/or HVAC Equipment Change-Out		
5	Enter Tested Leakage Flow in CFM: **Final Test** of New Duct System or Altered Duct System for Duct System Alteration and/or Equipment Change-Out.		
	TEST OR VERIFICATION STANDARDS: For Altered Duct System and/or HVAC Equipment Change-Out, Use one of the following Three Tests or Verification Standards for compliance:		
6	Pass if Leakage Percentage <15% [_____**(Line # 5)** / _____**(Line # 2)**] x 100	%	☐ Pass ☐ Fail
7	For systems certified by the installer as reducing leakage, pass if Leakage Reduction >60%. $\text{LeakageReduction} = 1 - \frac{\text{(Line\#5 HERS Tested Leakage)}}{\text{(Line\#6 Installer's Certified Pre-Test Leakage)}}$] x 100	%	☐ Pass ☐ Fail
8	Pass if all Accessible Leaks are sealed as confirmed by Visual Inspection and Verification by HERS rater (sampling rate 100%)		☐ Pass ☐ Fail
	Pass if One of Lines # 6 through # 8 pass		☐ Pass ☐ Fail

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Hydronic System Control Acceptance Document — MECH-8-A

NJ.10.1 - NJ.10.5 — **Form 1 of 4**

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
HYDRONIC SYSTEM NAME / DESIGNATION		Checked by/Date — Enforcement Agency Use

Intent: Satisfy HVAC water pumping requirements per Section 144(j).

Construction Inspection

1 Instrumentation to perform tests include, but not limited to:
   a. Differential pressure gauge
   b. Portable temperature probe

2 Variable Flow Controls (VFC) and Automatic Isolation Controls (AIC) Inspection

VFC AIC
☐ ☐ Valve and piping arrangements were installed per the design drawings to achieve the desired control

3 Supply Water Temperature Reset Controls Inspection
- ☐ Supply temperature sensors have been calibrated
  - ☐ Manufacturer's calibration certificates (attached)
  - ☐ Site calibration within 2° F of temperature measurement with reference meter
- ☐ Sensor locations are adequate to achieve accurate measurements
- ☐ Installed sensors comply with specifications

4 Water-loop Heat Pump Controls Inspection
- ☐ Valves were installed per the design drawings to achieve equipment isolation requirements
- ☐ All sensor locations comply with design drawings

5 Variable Frequency Drive Controls Inspection
- ☐ All valves, sensors, and equipment were installed per the design drawings
- ☐ Pressure sensors are calibrated
  - ☐ Manufacturer's calibration certificates (attached)
  - ☐ Site calibration within 10% of pressure measurement with reference meter

Certification Statement: I certify that all statements are true on this MECH-8-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Hydronic System Control Acceptance Document — MECH-8-A

NJ.10.1 - NJ.10.5 — **Form 2 of 4**

PROJECT NAME	DATE

A. System Type		System ID 1	2	3	4	5
1	Chilled water					
2	Heating hot water					
3	Water-loop heat pump loop					
4	Other (fill in blank):					
5	Other (fill in blank):					

B. Select Acceptance Test (check all tests completed)		1	2	3	4	5
☐	Variable Flow Control - Alternate 1 (Flow measurement)					
☐	Variable Flow Control - Alternate 2 (No flow measurement)					
☐	Automatic Isolation Controls					
☐	Supply Water Temperature Reset Controls					
☐	Water-loop Heat Pump Controls - Alternate 1 (With Flow Meter)					
☐	Water-loop Heat Pump Controls - Alternate 2 (Without Flow Meter)					
☐	(Pump) Variable Frequency Drive Controls - Alternate 1(With Flow Meter)					
☐	(Pump) Variable Frequency Drive Controls - Alternate 2(Without Flow Meter)					

C. Equipment Testing Requirements		System ID				
Verify and document the following (check applicable tests)		1	2	3	4	5
NJ 10.1 Variable Flow Control - Alternate 1						
Step 1: Open all control valves.						
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	System operation achieves design conditions	☐	☐	☐	☐	☐
Step 2: Initiate closure of control valves						
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	Design pump flow control strategy achieves flow reduction requirements	☐	☐	☐	☐	☐
d.	Ensure all valves operate correctly against the system pressure	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N
NJ.10.1 Variable Flow Control- Alternate 2						
Step 1:Drive all valves shut and dead head pump against manual isolation valve						
a.	Measured pressure across the pump (ft. H20) ΔP=					
Step 2: Open manual isolation valve and measure pump DP with control valves closed						
a.	Measured pressure across the pump (ft. H20) ΔP=					
b.	Both shutoff pressures are within +/- 5% of each other	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N
NJ.10.2 Automatic Isolation Controls						
Step 1:Drive all valves shut and dead head pump against manual isolation valve						
a.	Measured pressure across the pump (ft. H20) ΔP=					
Step 2: Open manual isolation valve and start/stop each chiller or boiler one at a time						
a.	Verify automatic isolation valve opens fully when respective unit is ON	☐	☐	☐	☐	☐
b.	Verify automatic isolation valve closes fully when respective unit is OFF	☐	☐	☐	☐	☐
Step 3: Stop all chillers and boilers on the hydronic loop						
a.	Measured pressure across the pump (ft. H20) ΔP=					
b.	Both shutoff pressures (1a and 3a) are within +/- 5% of each other	☐	☐	☐	☐	☐
Step 4: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Hydronic System Control Acceptance Document — MECH-8-A

NJ.10.1 - NJ.10.5 — **Form 3 of 4**

PROJECT NAME		DATE				
NJ.10.3 Supply Water Temperature Reset Controls						
Step 1: Manually change design control variable to maximum setpoint						
a.	Reset temperature setpoint °F =					
b.	Measured water temperature °F =					
c.	Water temperature setpoint is reset to appropriate value	☐	☐	☐	☐	☐
d.	Actual water supply temperature meets setpoint	☐	☐	☐	☐	☐
Step 2: Manually change design control variable to minimum setpoint						
a.	Reset temperature setpoint °F =					
b.	Measured water temperature °F =					
c.	Water temperature setpoint is reset to appropriate value	☐	☐	☐	☐	☐
d.	Actual water supply temperature meets setpoint	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N
NJ 10.4 Water-loop Heat Pump Controls (for circulation pumps > 5 hp) - Alternate 1						
Step 1: Open all control valves						
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.)	☐	☐	☐	☐	☐
Step 2: Initiate shut-down sequence on each individual heat pumps						
a.	Isolation valves close automatically upon unit shut-down	☐	☐	☐	☐	☐
b.	Ensure all valves operate correctly at shut-off system pressure conditions	☐	☐	☐	☐	☐
c.	System flow reduced for each individual heat pump shut down	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N
NJ.10.4 Water-loop Heat Pump Controls (for circulation pumps > 5 hp) - Alternate 2						
Step 1:Drive all valves shut and dead head pump against manual isolation valve						
a.	Measured pressure across the pump (ft. H20) ΔP=					
Step 2: Open manual isolation valve and measure pump DP with automatic isolation valves closed						
a.	Measured pressure across the pump (ft. H20) ΔP=					
b.	Both shutoff pressures are within +/- 5% of each other	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N
NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 1 (With Flow Meters)						
Step 1: Open all control valves						
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	Design pump power (estimated by motor HP/ motor efficiency x 0.746 kW/HP) kW =					
d.	System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.)	☐	☐	☐	☐	☐
e.	VFD operates near 100% speed at full flow	☐	☐	☐	☐	☐
Step 2: Modulate control valves closed						
a.	Ensure all valves operate correctly at system pressure conditions	☐	☐	☐	☐	☐
b.	Witness proper response from VFD (speed decreases as valves close)	☐	☐	☐	☐	☐
c.	Time for system to stabilize Min =					
d.	System operation stabilizes within 5 min. after test procedures are initiated	☐	☐	☐	☐	☐
Step 3: Adjust system operation to achieve 50% flow						
a.	Measured system flow (gpm) GPM =					
b.	Measured pump power at full flow kW =					
c.	%Power = part load kW/full load design kW (Step 3.b. / Step 1.c.) % =					
d.	VFD input power less than 30% of design	☐	☐	☐	☐	☐
Step 4: Adjust to achieve flow rate where VFD is below min speed setpoint						
a.	VFD minimum setpoint Hz =					
b.	Ensure VFD maintains minimum speed setpoint	☐	☐	☐	☐	☐
Step 5: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Hydronic System Control Acceptance Document — MECH-8-A

NJ.10.1 - NJ.10.5 — **Form 4 of 4**

PROJECT NAME	DATE

NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 2 (Without Flow Meters)						
Step 1: Open all control valves						
a.	Visually inspect a few valves to verify that they open					
b.	Time for system to stabilize Min =					
c.	System operation stabilizes within 5 min. after test procedures are initiated	☐	☐	☐	☐	☐
d.	VFD operates near 100% speed at full flow	☐	☐	☐	☐	☐
e.	Measured pressure at loop pressure sensor control point *(psi or ft WC)*					
Step 2: Modulate control valves closed						
a.	Visually inspect a few valves to verify that they close	☐	☐	☐	☐	☐
b.	Witness proper response from VFD (speed decreases as valves close)	☐	☐	☐	☐	☐
c.	Time for system to stabilize Min =					
d.	System operation stabilizes within 5 min. after test procedures are initiated	☐	☐	☐	☐	☐
e.	Measured pressure at loop pressure sensor control point *(psi or ft WC)*					
f.	Measured pressure with valves closed ≤ pressure with valves open	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N

D. PASS / FAIL Evaluation (check one):	
☐	PASS: All applicable **Construction Inspection** responses and applicable **Equipment Testing Requirements** are compete.
☐	FAIL: Any applicable **Construction Inspection** responses are incomplete *OR* there is one or more unchecked box for an applicable test in the **Equipment Testing Requirements** section. Provide explanation below. Use and attach additional pages if necessary.